stables, and 29 frame buildings. Of the 393 buildings, 293 are situate north of Fortieth Street.

In Chicago, Sandusky, St. Louis, Philadelphia, Fort Madison, and Detroit, the building "outlook" is equally encouraging.

ORDERS for new cars have been pouring into the manufacturers' offices of late quite lively.

The Harrisburg (Pennsylvania) Car Company has a contract for 1000 coal cars, to be built for the Central Railroad of New Jersey, and one of 600 box cars for the Canada Southern. These contracts will employ 600 men.

The car works of Messrs. Billmeyer, Small & Co., at York, Pa., have received an order to build 700 freight cars.

The Lehigh Car Manufacturing Company at Stemton, Pa., have just completed 500 freight cars for the New York, Lake Erie and Western Railroad Company, and have begun work on another 500 cars order for the same company.

READERS will have noticed our advertisement of "cheap drawings" in the WOOD-WORKER, and will not be surprised if we tell them that the orders received for the goods advertised have astonished us. So great have been the results, that many of the numbers have given out, and we are now unable to supply complete sets, as first advertised. We still have a good supply of "detail sheets," which will be sent as advertised in the present number.

These "detail sheets" have all appeared in the *American Builder*, and those having complete sets of that journal will have no use for the drawings advertised. We mention this to avoid misapprehension, as several parties have written us to the effect that they had similar drawings before, and therefore had no use for a second lot.

WE have all the back numbers of the WOOD-WORKER in stock at present, but do not know how long they will hold out, although we printed a large edition, as they are being sold off very rapidly. Parties desiring back numbers should send for them at once, as it will soon be impossible to obtain them.

Practical Carpentry.

WE continue the methods of obtaining the curves for Gothic arches of different kinds.

Fig. 1, Plate 38, shows how a four-centred arch can be obtained when the height, width, or span are given. Let A C be the span of the arch, and D B its height; divide D B into five equal parts, in 1, 2, 3, *g*, B, and set off on the line A C, from A and C, three of those parts to A *h*, C *k*. Then from the point *g*, with the radius *g h*, describe the arc *n h k o*, and from the points *h k*, with the radius A *h* or C *k*, describe the arcs A *n*, C *o*. From the intersections of these arcs with the arc *n h k o*, and through the centres *h k*, draw *n h* F, *o k* E. Then bisect *n* B, *o* B in *l* and *m*, and produce the lines until they meet *n h* F and *o k* E in F and E, which two last points are the centres of the arcs *n* B, *o* B.

Another Method.—Bisect the width of the arch A C (Fig. 2) in D, draw the perpendicular D B, and make it equal to the height of the arch. Divide it into three equal parts: through the second division draw 2 E parallel to A C, intersecting the line C E drawn from C perpendicular to A C in E. Join E B, and draw from B the line B G F at right angles to it. On C A set off C H equal to D 2; and on B F set off B G equal also to D 2: join G H, and bisect it at *n*. From the point F, where the bisecting line meets B G F, draw F H *k*. Then H will be the centre of the arc C *k*, and F the centre of the arc *k* B. For the other side of the arch, draw F *m* parallel to A C; and from the centre line B D produced, set off *m* equal to F: draw *m l*.

Another Method.—Divide the height D B (Fig. 3) into two equal parts, and draw 1 E parallel to A C, and meeting the perpendicular C E in E. Join B E, and draw B F at right angles to it: set off from C and B the points H and G, equal to D 1. Join H G, and bisect the line in *k*. The point F, in which the bisecting line of G H cuts B F, is the centre of the larger arc *l* B, and H is the centre of the smaller arc C *l*.

To describe a Gothic arch by the intersection of straight lines, when the span and height are given.—Bisect A C (Fig. 4) in D, and from the point D and the extremities of the line draw A E, D B, C F at right angles to A C, and each equal to the height of the arch: join E B, B F. Divide the line D B into any number of equal parts, 1, 2, 3, B, and through the divisions draw lines parallel to A C. Divide the line E B, B F into the same number of equal parts, and from A and C draw lines A 1, A 2, A 3; and their intersection with the horizontal lines in *f*, *g*, *h*, will be points in the curve required.

To draw the arches of Gothic groins, to mitre truly with a given arch of any form.—Let A C (Fig. 5) be the width of body range, and B D its height. Join C B, and divide it into any number of equal parts: from the centre D, through the points of division, draw straight lines D 1, D 2, D 3, D 4, meeting the circumference of the arch in *l*, *m*, *n*, *o*. From B, through these points in the circumference, draw B *o*, B *n*, B *m*, B *l*, and produce them to meet a perpendicular raised from C.

Let A C (Fig. 6) be the width of the groin arch, and D B its height. Join A B, and divide it into the same number of parts as C B in Fig. 5 ; and draw through the points 1, 2, 3, 4 the lines D 1, D 2, D 3, D 4. Then from A draw a line perpendicular to A C, and transfer to it the divisions from the corresponding line in Fig. 5 ; and from these divisions draw lines to B. The intersection of these lines with the lines D 1, D 2, etc., will give points through which the curve may be traced.

To draw an ogee arch.—Divide the width A B (Fig. 7) into four equal parts in *d, c, e ;* and on *d, e* erect the square *d, f, g, e.* The points *d, e, f, g,* are the centres of the four quadrants A *k, k l,* B *h, h l,* composing the arch.

Another Method.—Let A C (Fig. 8) be the width and D B the height of the arch. Join A B, B C, and bisect the lines in *e, f ;* then from the centres, A, *e,* B, *f,* C, with the radius A *e* or *e* B, describe the arcs intersecting in the points *g, h, k, l,* which are the centres of the four arcs composing the ogee arch.

Another Method.—When the arch is equilateral. Bisect A B (Fig. 9) in C, join A *h,* B *h.* From C, with the radius A or B, describe the arcs A *d,* B *e ;* then, to find the centres of the other arcs, from the points *d, e,* and *h* as centres, and with the same radius as before, describe arcs intersecting each other in the points *f* and *g,* which are the centres of the arcs *h d, h e.*

Lessons in Projection.

BY ROBERT RIDDELL, TEACHER OF THE ARTISAN CLASS IN THE HIGH SCHOOL, PHILADELPHIA, PA.

Projection of Straight Lines and Curves.—Let A (Fig. 1, Plate 39) be the given plan, and B C the angle of projection. Draw perpendiculars through the plan, cutting B C. The distances thus given on the angle are transferred to the line C D, from which trace the different members that are to project and intersect with those of plan A.

The elliptical curve K R is obtained by finding two foci as N L, in which fix two pins as shown ; then with a piece of thread and a pencil strike the curve the usual way ; this curve, when in position, will be found to stand directly over the quarter circle shown on plan A. This principle of obtaining a curve is precisely the same as for finding the section of a cylinder when cut by a plane not parallel with the base.

To understand and form correct ideas of complex problems of this kind, there is no better way than by making a drawing of each one on card-board, and then cutting it at the lines so that it will fold up to the desired shape. If the cut parts do not come freely together without twisting or buckling, there will be some error in the constructive principle which can generally be speedily rectified. It will be seen that by adapting this method of testing problems many serious mistakes may be avoided.

In the problem before us the lines to be cut are marked with crosses, and the bases of these cut parts are marked *o, o, o.* Now let us take that part marked B *x x x x,* and raise it on the folding line *o o* until it is perpendicular with the plan A. Then take the part D K, R S, and C, and fold over at the base line *o o* until it lays on the inclining line B C ; it will be seen then that the work is correct, as the lines on D will stand perpendicularly over the corresponding lines on the plan A.

The parts S S should be removed, as by doing so a better idea of the working of the problem will be obtained.

The method of teaching projection by cutting cardboard has many advantages over all other modes of instruction ; in fact, it is a workshop operation, as the pupil sees before him a model of the work, and is thereby better able to proceed with the work when putting it in actual practice.

The Sectorian System of Hand-Railing.

FIFTH PAPER.

FIG. 1 (Section 1, Plate 34) in this example shows the ground plan of platform stairs, with one half the landing and ascending treads placed in the platform. The cylinder is of larger size than is generally used for this kind of stairs, and I give this example to show that as easy and as graceful a wreath can be thrown around this as any of smaller size.

Fig. 2 is the lower piece of wreath with a part of straight rail attached. The sections of rail at each end show the direction given by the spring and plumb bevels, which are the same. The bevel, Fig. 6, astride the tangents of this figure shows the angle as obtained on the sector, Fig. 3, which, when folded to an angle of ninety degrees and each blade placed on the line, shows the pitch of half a riser from the chord line to the centre of the cylinder. The angle is obtained, as shown, for getting the tangents of one half the wreath, one mould answering for both pieces by reversing the end. The shank may extend as far as the thickness of stuff will allow.

Fig. 3 is the sector with the line showing the rise, and the horizontal lines, giving the height of half a riser.

Fig. 4 is the shape of the outside falling mould, and is obtained by getting the stretch-out of convex side of wreath from face of the

PLATE 38

FIG. 1.

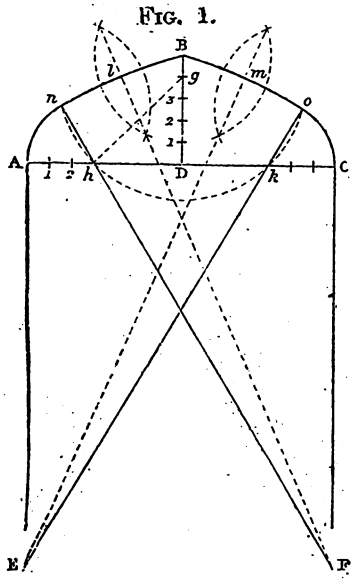

FIG. 5.

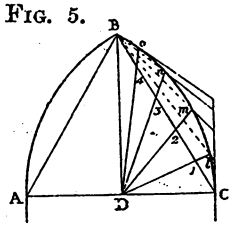

FIG. 2.

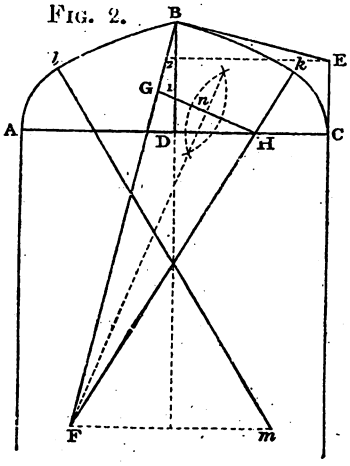

FIG. 4.

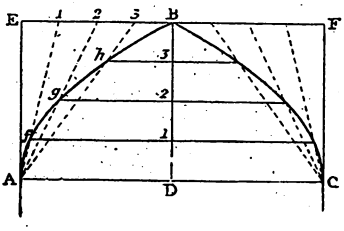

FIG. 3.

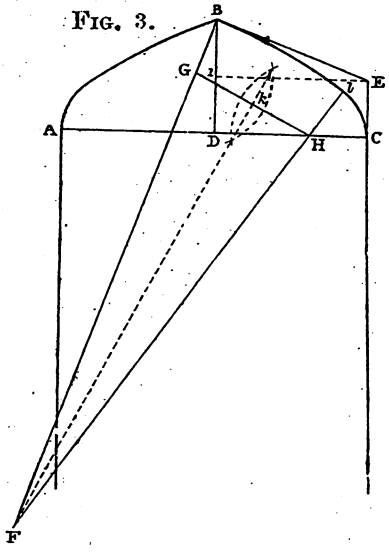

FIG. 6.

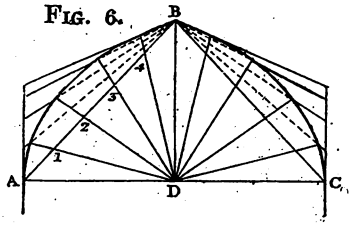

FIG. 7.

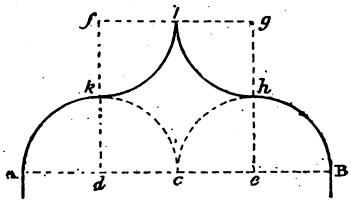

FIG. 8.

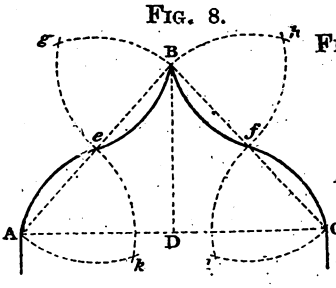

FIG. 9.